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## **Retrofit Diesel Particulate Filters – Ease of Application**

**International Diesel Retrofit Advisory  
Committee**

**October 2, 2001  
California**



### **Introduction**

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- Based on MECA Members' Experience to Date with Diesel Particulate Filters and Engineering Judgement
- Input from Engine Manufacturers and Others Desired
- Living Document
  - Increased Experience
  - Technological Advances
  - New Approaches/Technologies
- Implication of a Tiered Verification Process



## **Selection of A Regeneration Strategy**

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- Application and Duty Cycle
- Engine Out Emission
- Vehicle/Engine Condition
- Fuel Sulfur Level
- Maintenance and Operational Procedures



## **Regeneration Strategies Used to Date In Retrofit Applications**

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- Engine Reliant
  - Mining and Construction
  - Relies Solely on Engine Exhaust Gas Temperature
  - Applicable in Limited Circumstances
- Catalyst-Assist
  - Mining, Construction, Onroad, Locomotive, Marine, and Stationary
  - Promotes the Oxidation of Collected Particulate at Lower Temperatures
  - Several Manufacturers Indicate that Exhaust Temperatures Must Exceed in the Range of 250 to 275 °C for Over 30% to 50% of the Time



## Regeneration Strategies Used to Date In Retrofit Applications (cont.)

- Electric Heater-Assist
  - Mining, Construction, and Materials Handling
  - Shore Power (on- or off-board)
  - Performed Between Shifts
- Fuel Burner-Assist
  - Stationary
  - In-line, Full Flow Fuel Burner
- Intake/Exhaust Throttling
  - Mining and Construction
  - Increases Exhaust Temperature
  - Limited Use
- Exchange and Off-Board Regeneration
  - Mining and Materials Handling



## Applications Matrices

Retrofit Analysis				
Application	Common Engines	Past Experience	Probability (1-10)	Remarks
School Bus	CAT 3208			
	<1988		5,6-7	
	1988 - 1990	CA School Bus	5,6-7	
	>1991		8-9, 10	
	CAT 3116			
	<1988		5,6-7	
	1988 - 1990		5,6-7	
	>1991	CA School Bus	8-9,10	
	CAT 3126			
	1988 - 1990		8-9	
	>1991	Engine Testing	10	
	Navistar 530			
	<1988		6	
	1988 - 1990		6	
	>1991	CA School Bus	6	
	Navistar 530 E			
	<1991	CA School Bus	10	
	Navistar 466			
	<1988	CA School Bus	6-7	
	1988 - 1990		6-7	
	>1991	CA School Bus	10	
	DDC 6L-71			
	<1988	CA School Bus	2-3	dirty, 2 stroke, cold
	1988 - 1990		2-3	dirty, 2 stroke, cold
	>1991		2-3	dirty, 2 stroke, cold



## Applications Matrices

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### ● Legend Based On:

- 10: Based on past experience and/ or known vehicle and engine operation, filters can be retrofitted with no anticipated problems.
- 8-9: Based on past experience and/or known vehicle operation, filters can be retrofitted with no anticipated problems. However, there may be limited exceptions, e.g. specific applications regarding duty cycles, vehicle integration, etc., that may cause problems or require the use of emerging technologies.
- 6-7: Filter retrofit is more challenging or the application looks promising but more experience or the development of new systems is needed.
- 5: Little or no experience, but engineering judgment indicates that it is possible either with existing technologies or technologies being developed.
- 3-4: Little or no experience, but engineering judgment indicates that it appears challenging with existing technologies or emerging technologies.
- 2: Filter retrofit is unlikely.
- 1: Based on experience and/or engineering judgment, filter retrofit is not possible.



## Implication of Tiered Verification Procedure

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- Allows for Non-Filtered Based Retrofit Strategies
- Dramatically Changes the “Probability of Success” Numbers Contained in the “Application Matrices”
- Is 30% the Appropriate Lower Cut Point?

In Fact, Retrofit Becomes Viable for Virtually  
Every Application

